

# Using chemicals policy to drive green chemistry: children's car seats case study



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*Chemical policy drives the demand for safer alternatives; the science of green chemistry provides the solutions.*

**Amy Cannon & John Warner**

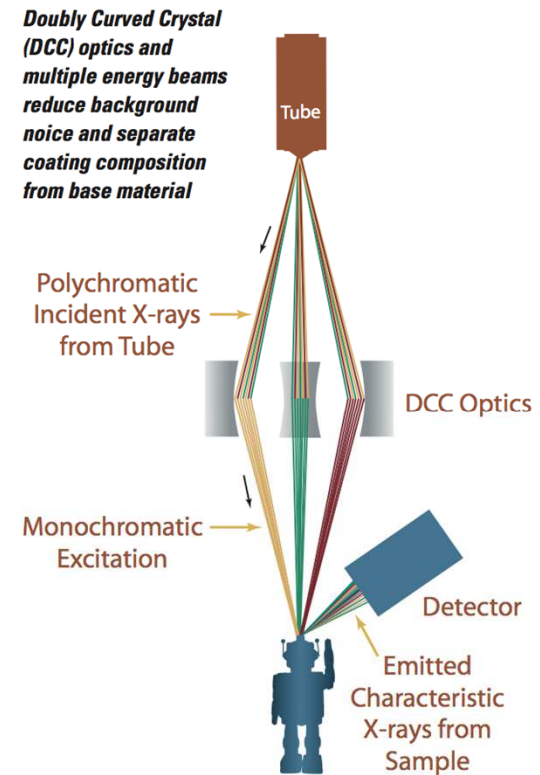


# XRF Testing

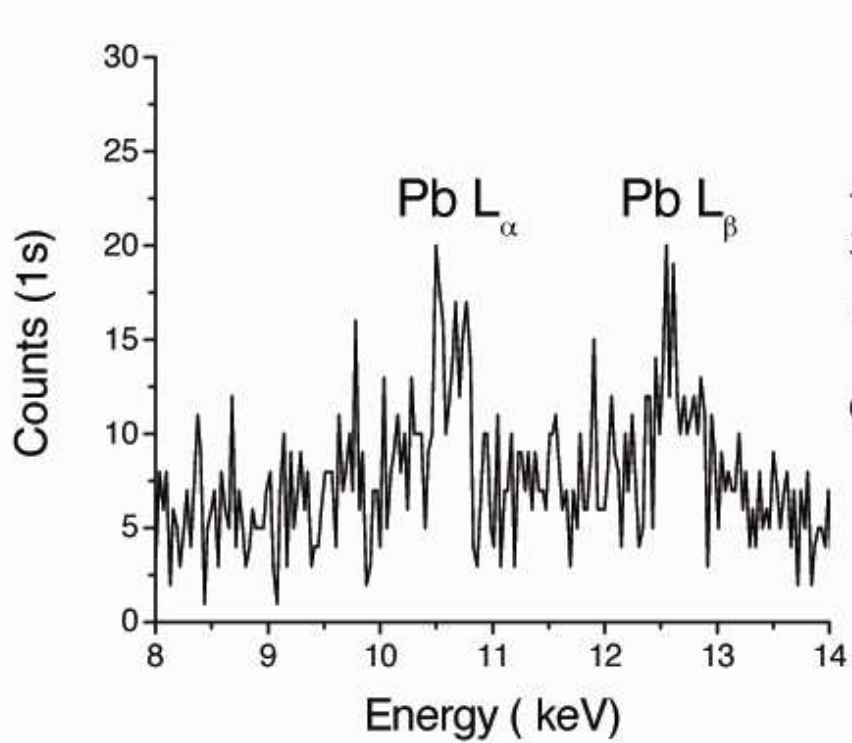
- Non-destructiveness
- High speed (10-30 sec)
- Portability
- Low cost compared with traditional methods
- Applicability to wide range of media, e.g. soils, alloys, plastics, fabrics, etc
- High correlation with conventional analytical methods (GC/MS, AA)
- Actively developing new testing techniques

## Detection Limits

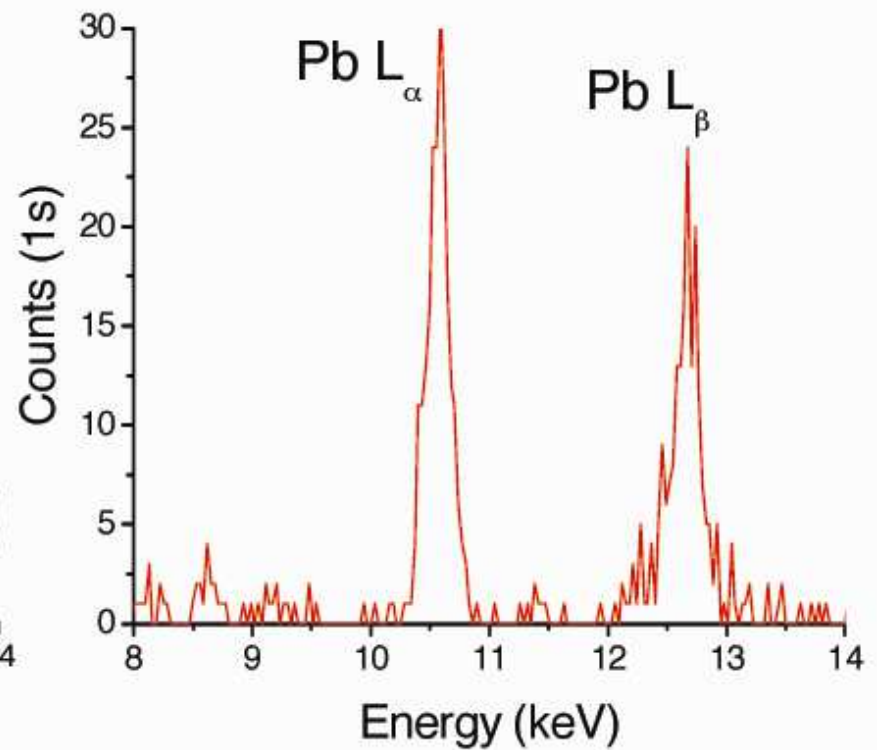
LOD in ppm	Pb	Cd	Cr	As	Br	Sb	Se	Hg	Ba	Cl
Plastic Substrate	.8	2	2	.8	1	5	1	1	50	100*
PVC Substrate	1	2	5	1	1	5	1	2	100	N/A
Coating on Plastic	5	50*	15	5	5	100*	5	8	200*	150*
Metal Substrate	10	5	15	8	N/A	20	5	10	200*	N/A
Coating on Metal	8	30*	15	8	5	60*	5	10	200*	150*



\*Longer measurement time



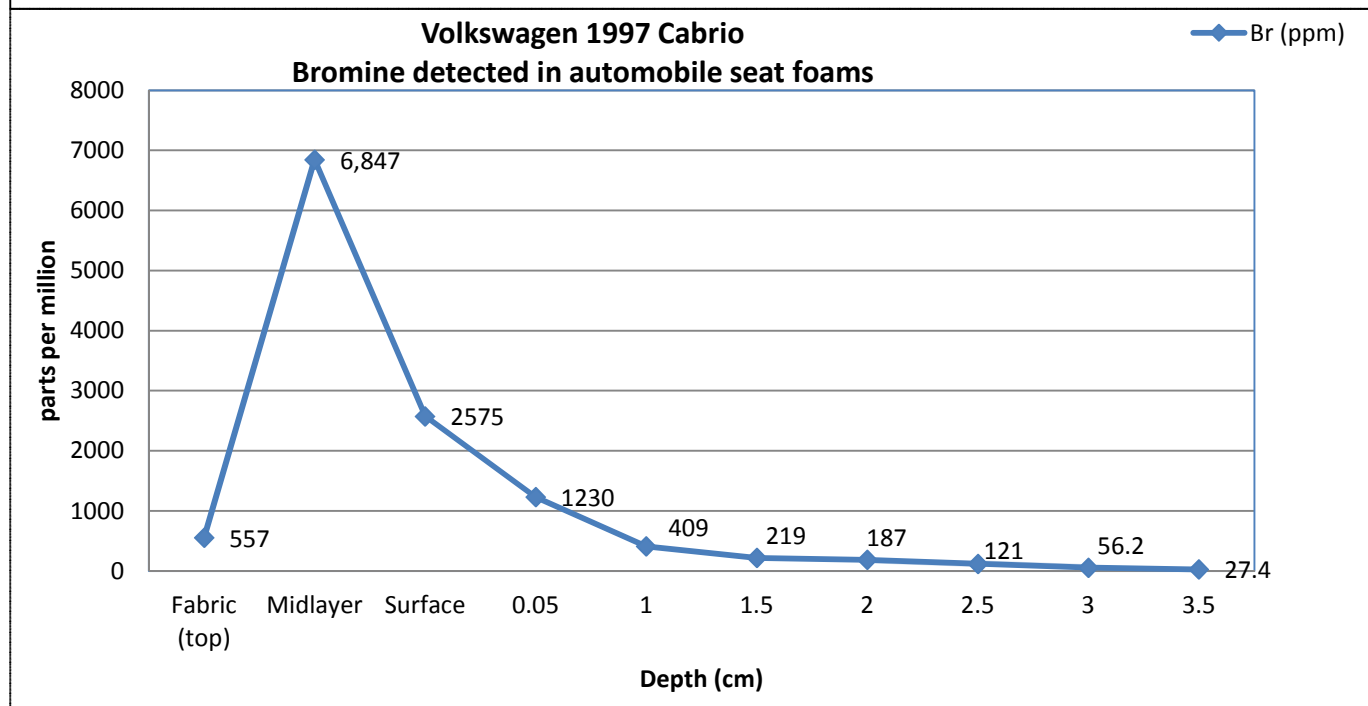
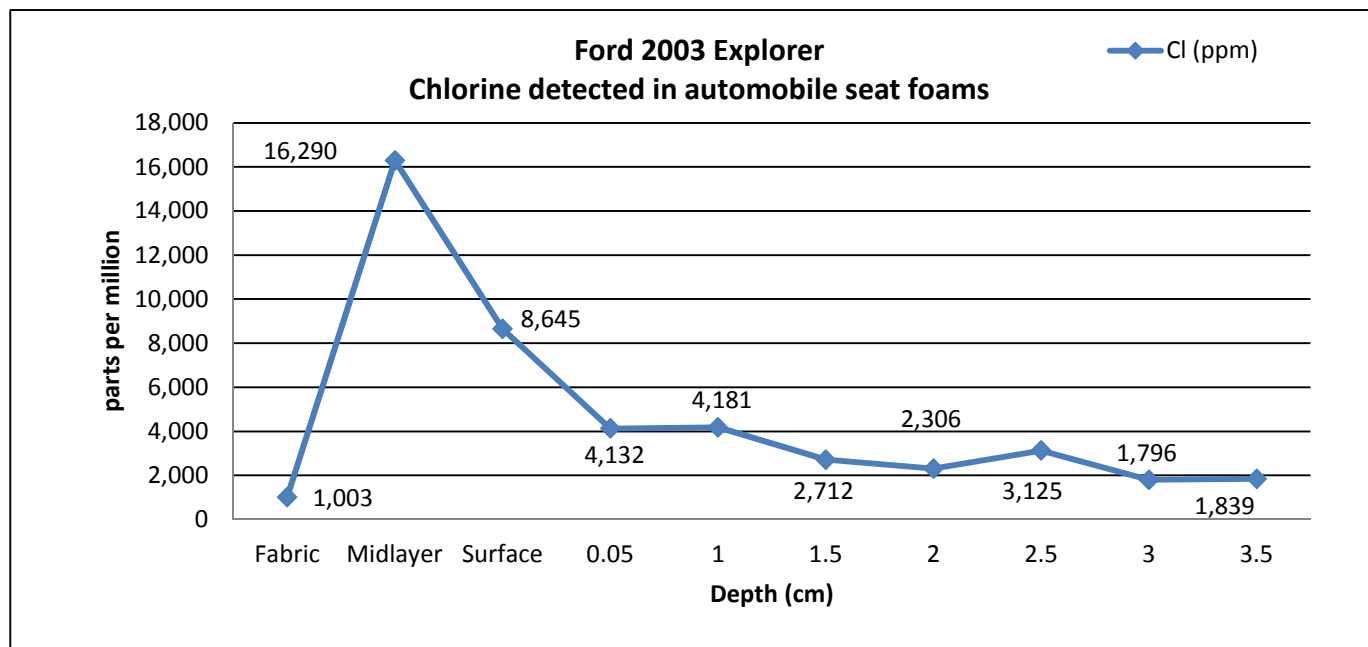
Traditional XRF



HD XRF

# FR Migration





## SnugRide 30 Car Seat in Asprey

Brand: Graco (Infant)

Overall Score: **2.2 out of 5**



### Clip

Lead: 0 ppm

Chlorine: 0 ppm

Bromine: 0 ppm

### Seat

Lead: 69 ppm

Chlorine: 46,332 ppm

Bromine: 16,073 ppm

### Base

Lead: 0 ppm

Chlorine: 0 ppm

Bromine: 0 ppm

## Marathon 70 in Jet Set

Britax



### Product Data

Product Name:	Marathon 70 in Jet Set
Manufacturer:	Britax
Manufacture Year:	2011
Manufacturer Code:	652182063948
Test Date/Location:	2011-02-14/MI
Product Group:	<a href="#">Children's Products</a>
Product Type:	Car Seat (Convertible)
Test Method:	XRF
View Full Report:	<a href="#">Graco Bans Hazardous Flame Retardants</a>

### Components Tested

Component	Bromine	Chlorine	Lead
Base	0	0	0
Clip	1,025	0	16
Seat	2,043	0	0

Note: The above results are in parts per million (PPM) of a given chemical.

### Product Rating

Key: HIGH MED LOW

4.6

## Overall Level

Bromine

4.8

Chlorine

0.0

Lead

1.0

Others

2.0

IMPORTANT NOTE: HealthyStuff.org ratings do not provide a measure of health risk or chemical exposure associated with any individual product, or any individual element or related chemical. [Follow this link](#) to read more.

	<b>Advanced No Back in Red</b> Evenflo – January 19, 2011	0.5	MED OVERALL
	<b>Advocate 70 CS in Cowmooflage</b> Britax – February 17, 2011	1.2	MED OVERALL
	<b>Advocate 70 CS in Onyx</b> Britax – February 17, 2011	2.6	HIGH OVERALL
	<b>Advocate 70 CS in Opus Gray</b> Britax – February 14, 2011	1.2	MED OVERALL
	<b>Advocate 70 CS in Riviera</b> Britax – February 17, 2011	0.8	MED OVERALL
	<b>Air 65 in Marshall</b> Safety 1st – February 17, 2011	1.0	MED OVERALL
	<b>Air 65 in Sugar &amp; Spice</b> Safety 1st – February 17, 2011	0.4	MED OVERALL



## 2007 Car Seat Test Results

25,900 & 27,300 ppm bromine (BFRs) in seat base

15,200 & 16,400 ppm lead in black fabric and  
sunshade

EPS foam contained 3,900 ppm bromine

# 2010 Orbit Stroller G2



All contact fabrics Oeko-Tex certified

**orbit green:** OrganicFR™

Proprietary dual-layer construction of organic cotton and wool. Complies with FMSS 302 & CA TB 117.

**orbit green:** PVC-free Material  
PVC-free, Chlorine-Free, Phthalate-free





## 2011 HealthyStuff.org Best & Worst Picks Car Seats, Overall



### Ten Best Picks

Graco Turbo Booster in Anders	Booster	0.0
Graco SnugRide 35 in Laguna Bay	Infant	0.1
Chicco KeyFit 30 in Limonata	Infant	0.1
Combi Shuttle 33 in Cranberry Noche	Infant	0.1
Graco SnugRide 35 in Flint	Infant	0.2
Chicco KeyFit 30 in Cubes	Infant	0.2
Graco SnugRide 30 in Mirabella	Infant	0.2
Baby Trend Flex Loc in All Star	Infant	0.2
Chicco KeyFit 30 in Extreme	Infant	0.2
S1 by Safety 1st onBoard35 Air in McKenna	Infant	0.2
Britax Chaperone in Cowmooflage	Infant	0.2
Graco SnugRide 35 in Hathaway	Infant	0.2

### Ten Worst Picks

Recaro Pro Booster in Blue Opal	Booster	4.8
Britax Marathon 70 in Jet Set	Convertible	4.6
Recaro ProSPORT Toddler in Misty	Booster	3.6
Recaro ProRIDE in Midnight	Convertible	3.4
Britax Marathon in Platinum	Convertible	3.4
Evenflo Best for Baby in Chase DLX Brown	Booster	3.2
Cosco Scenera in Richmond	Convertible	3.0
Britax Marathon Classic in Solstice	Convertible	3.0
Graco My Ride 65 in Prentis	Convertible	3.0
Evenflo Momentum65 in Olympic	Convertible	2.8

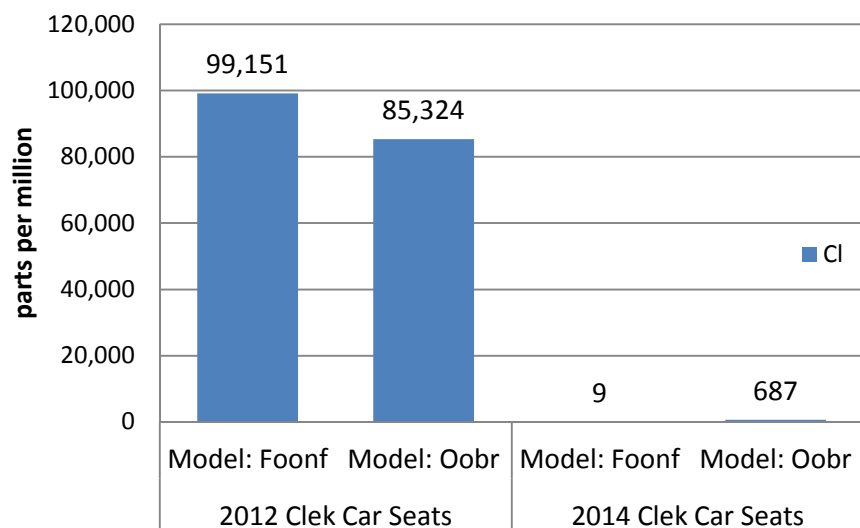


**clek**

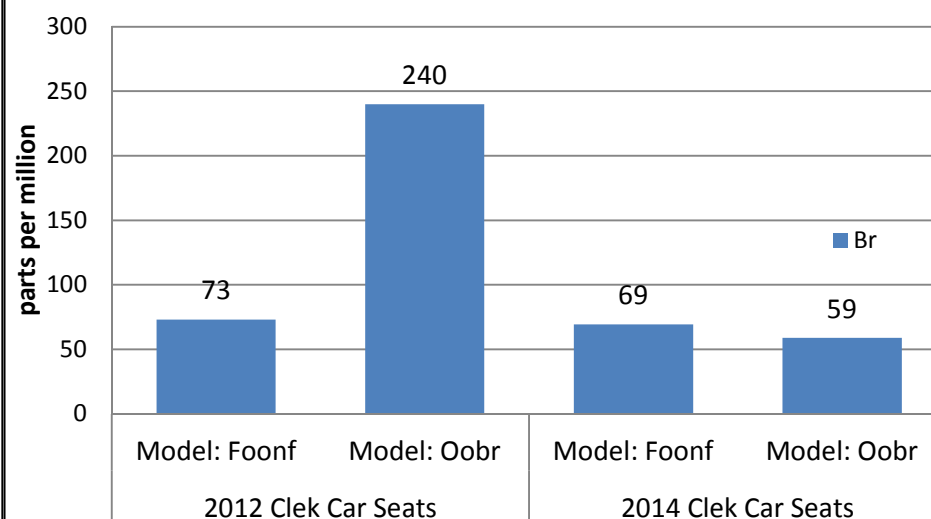


## Clek Infant Car Seats and the reduction of halogenated flame retardants between 2012 and 2014

**Chlorine levels in Clek Infant Car Seats**



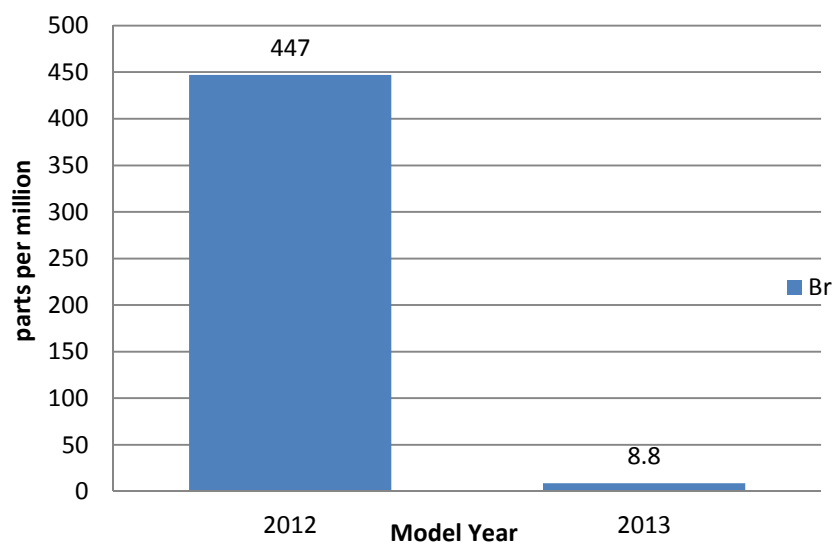
**Bromine levels in Clek Infant Car Seats**



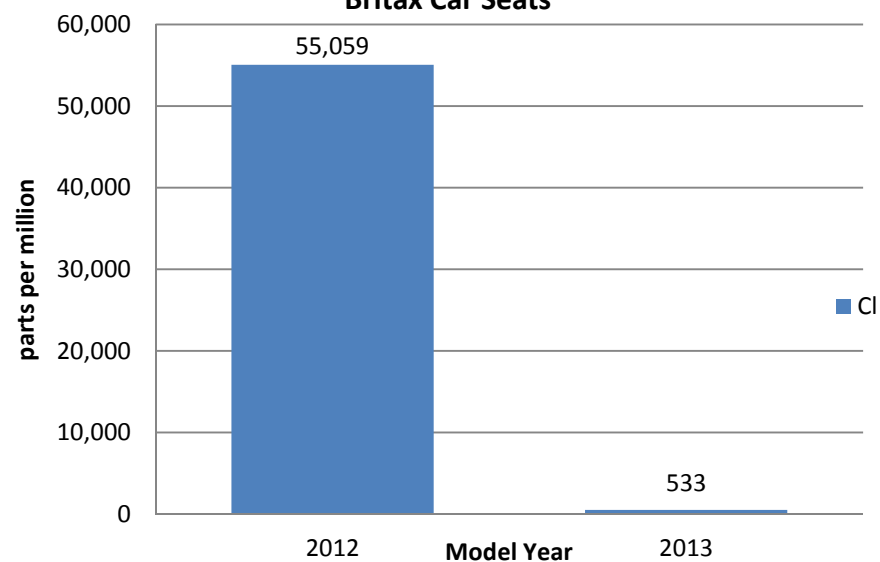


## Britax Infant Car Seats and the reduction of halogenated flame retardants

**Concentration of Bromine in 2012 and 2013  
Britax Car Seats**



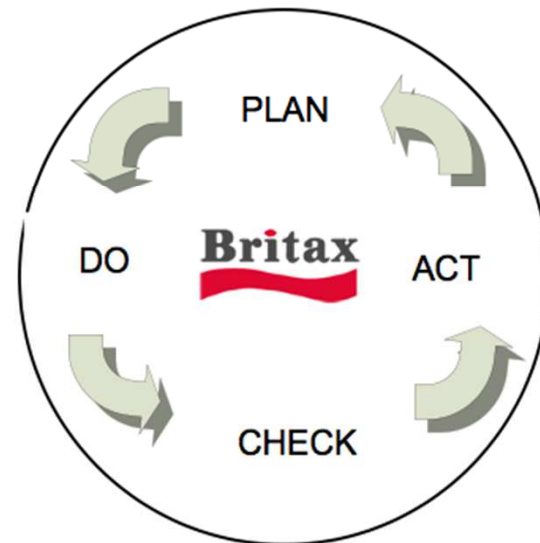
**Concentration of Chlorine in 2012 and 2013  
Britax Car Seats**



# New Standards

- QSP-0712-2 for hard hard plastic component parts.
- BTS-F001 for foams, fibers, filling materials, webbing and non-wover materials
- Revisions adopted in Sept 2012

## Britax Quality System Procedure



# QSP-0712 “hard” materials standard

- All potential materials are to be submitted for approval prior to implementation. Include colorants, all additives including UV and anti-static treatments.
- Bromine <100 ppm
- Chlorine <10,000 ppm
- Lead <100 ppm
- Antimony <400
- EN 71 - Part 3  
(Migration of Certain Elements - Pb, Cr, As, Sb, Cd, Ba, Hg, and Se.

# QSP-0712 “hard” materials standard

## Phthalates <0.1%

Di-2-ethylhexyl phthalate (DEHP)

Dibutyl phthalate (DBP)

Butyl benzyl phthalate (BBP)

Di-iso-nonylphthalate (DINP)

Di-iso-decylphthalate (DIDP)

Di-n-octyl phthalate (DNOP)

Bis(2-methoxyethyl) phthalate (DMEP)

Diethyl phthalate (DEP)

Diisobutyl phthalate (DIBP)

Di-C6-8-branched alkylphthalates (DIHP)

Di-C7-11-branched alkylphthalates (DHNUP)

Di-n-Hexyl phthalate (DHP)

# QSP-0712

## “hard” materials standard

All materials selected (as well as the final, post-processed component) must not contain any of the following restricted flame retardant chemicals:

Any chemical substance or mixture containing the halogens chlorine or bromine

Polybrominated biphenyles (PBB)  
Tri-(2,3-dibromopropyl)-phosphate (TRIS) - Tris-(aziridiny)-phosphin oxide (TEPA)  
Tris (2-chloroethyl) phosphate (TCEP)  
Tri(2,3-dichloropropyl) phosphate (TDCPP)  
Tris (1-chloro-2-propyl) phosphate (TCPP)  
Tetrabromobenzoate (TBB)  
Bis(2-ethylhexyl)-tetrabromophthalate (TBPH)  
Decabromodiphenylether (Deca-BDE)  
Pentabromodiphenylether (Penta-BDE)  
Octabromodiphenylether (Octa-BDE)  
Hexabromocyclododecane (HBCDD)  
Tetrabromobisphenol A (TBBPA)  
Short Chain Chlorinated Paraffins (C10-C13) (SCCP)  
Antimony Trioxide

# BTS-F001

## “soft” materials standard

- Only Phosphorus-based, 100% halogen-free flame retardants (those not containing any chlorine, bromine, or other halogens) are to be used and only as needed to achieve the flammability requirements described below
- reference website: [www.pinfra.org](http://www.pinfra.org) to access a guide for selecting non-halogenated FR chemicals.

The logo for the Phosphorus, Inorganic & Nitrogen Flame Retardants Association (pinfa). The word "pinfa" is written in a lowercase, sans-serif font. The "pin" is in white, and the "fa" is in a bright yellow-green color.

Phosphorus, Inorganic & Nitrogen Flame Retardants Association

# BTS-F001

## “soft” materials standard

- The use of “proprietary” or “black-box” chemical formulas for the purpose of achieving flame-retardant properties is not permitted. All formulations used must be fully disclosed.
- XRF scanning will be used to determine if the component is halogen-free (<100 ppm of detectable bromine and <10,000 ppm chlorine).

# BTS-F001

## “soft” materials standard

- The XRF Scanning method: All components or materials used must not exceed the following limits:
  - Bromine, Lead, Cadmium, Antimony, and Arsenic: less than 100 ppm.  
Exception for polyesters only: total
  - Antimony content must be less than 400 ppm if the Antimony is used as a processing catalyst.
  - Barium, Mercury, Chromium, Cobalt, and Selenium, and Molybdenum: less than 1,000 ppm.
  - Chlorine: less than 10,000 ppm. If Chlorine is detected with XRF methods: supplier must provide documented evidence that Cl is only used in small concentrations for water purification purposes.



# **Thank You!**

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